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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Tien-Jen Cheng

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EXAMINER

LEE, EUGENE

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/707,892	Applicant(s) CHENG ET AL.	
	Examiner EUGENE LEE	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 January 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7-14 and 21-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-14 and 21-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 1/8/09 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the (1) said hard test barrier layer extends along the sides of said conducting layer pad and said conducting layer pad is completely enclosed by ... said hard test barrier layer (i.e. claim 1), adhesion layer (i.e. claim 2), and collapsible chip connections (i.e. claim 5) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Regarding (1), in Fig. 1, which is a cross-sectional view, the conducting layer pad 114 is not completely enclosed by said hard test barrier layer 116. Even though FIG. 3G, which is also a cross-sectional view, shows the seed pad 152 enclosed by a hard test barrier layer 154, it does include the other limitations, for example, “pad array being directly probable at said hard test barrier layer” of claim 1 to comprehensively show every feature of the claimed invention.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

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application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 5, 14, and 25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The specification does not disclose wherein pads in said pad array may be spaced at minimum pitch.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 2, thru 4, and 8 thru 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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In claim 2, it is unclear whether the limitation “barrier metallurgy” is referring to the “diffusion barrier layer” in line 3 of claim 1 or whether it is generally referring to any “barrier layer”, however, in claim 3, it appears “barrier metallurgy” is referring to a separate unique barrier layer, unique from the previously mentioned “diffusion barrier layer” and “hard test barrier layer.” It appears the “diffusion barrier layer” and “barrier metallurgy” are the same structure, however, appropriate clarification and/or correction are required.

In claim 8-14, it is unclear whether the limitation “adhesion/barrier layer” is referring to two separate layers or one layer. Appropriate clarification and/or correction are required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1 thru 5, 7 thru 14, and 21 thru 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Degani et al. 6,232,212 B1 in view of Hosomi et al. 5,631,499. Degani discloses (see, for example, FIG. 8) a UBM (durable chip pad) comprising an Al contact (terminal metal layer) 13, first layer (diffusion barrier layer) 21, second layer (adhesion layer) 22, copper layer (conducting layer pad) 23, and gold layer (plate passivating layer) 24. Degani does not disclose a hard test barrier layer. However, Hosomi discloses (see, for example, FIG. 31) a semiconductor device comprising a second thin metal film (hard test barrier layer) 2b in between two other metal layers. In column 7, lines 31-33, Hosomi discloses the metal film

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extending onto the passivation film beyond the edge of barrier metal that the edge of the barrier metal is protected from side-etching. It would have been obvious to one of ordinary skill in the art at the time of invention to have a hard test barrier metal in order to protect the metal layers underneath it from side-etching.

Regarding the limitation “one pad in a pad array of identical durable chip pad”, see, for example, column 1, lines 31-33, wherein Degani discloses arrays of I/O contact pads.

Regarding the limitation “being directly probable”, see, for example, FIG. 31 of Hosomi wherein Hosomi discloses the layer 2b being exposed and therefore “being directly probable”.

Regarding the limitation “at said hard test barrier layer during chip performance testing and prior to any additional far back end of the line (FBEOL) processing”, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex Parte Masham*, 2 USPQ F. 2d 1647 (1987).

Regarding claims 2, and 4, see, for example, column 3, line 47 wherein Degani discloses the second layer (adhesion layer) 22 as Cr/Cu.

Regarding claim 3, see, for example, column 3, line 41 wherein Degani discloses the first layer (barrier metallurgy) 21 as Ti.

Regarding claim 4, see, for example, column 8, line 18 wherein Hosomi discloses the second thin metal film (hard test barrier layer) 2b as nickel.

Regarding claims 5, and 14 see, for example, FIG.8 wherein Degani discloses a solder bump (collapsible chip connections) 71.

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Regarding claim 7, see, for example, column 3, line 64 wherein Degani discloses the gold layer (plate passivating layer) 24.

Regarding claims 8-11, and 13, see, for example, FIG. 8 wherein Degani discloses a UBM (durable chip pad) comprising an Al contact (terminal metal layer) 13, second layer/ first layer (adhesion layer/ diffusion barrier layer) 22/ 21, copper layer (seed pad) 23, and gold layer (plate passivating layer) 24.

Regarding claims 12, and 21, Degani in view of Hosomi discloses the claimed invention except for a 0.5-30 um thick nickel layer. However, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a 0.5-30 um thick nickel layer in order to adequately cover the underlying metal layers, and since it has been held that discovering an optimum value of a result effective value involves only routine skill in the art. In re Boesch, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 25, Degani in view of Hosomi discloses the claimed invention except for a soldering bumping forming 3 mil controlled collapsible chip connections. However, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have 3 mil controlled collapsible chip connections in order to form solder bumps that are strong enough to connect to other devices, and since it has been held that discovering an optimum value of a result effective value involves only routine skill in the art. In re Boesch, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

Response to Arguments

8. Applicant's arguments with respect to claims 1-5, 7-14, and 21-25 have been considered but are moot in view of the new ground(s) of rejection.

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INFORMATION ON HOW TO CONTACT THE USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EUGENE LEE whose telephone number is (571)272-1733. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Eugene Lee
February 17, 2009
/Eugene Lee/
Primary Examiner, Art Unit 2815